REMARKS

Claim Rejections Under 35 U.S.C. § 103(a)

Claims 1, 2, 4-11, 15-19, 21, and 22 remain rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 6,355,723 to van Baal et al. ("van Baal"). 1/11/05, page 5, paragraph no. 13. Applicants respectfully traverse this rejection.

Applicants respectfully assert that the rejected claims are patentable over van Baal for at least three reasons. First, van Baal is distinguishable from the present invention because it solves a different problem with a different solution. Second, the Applicants' claim 1 limitation that the haze-prevention layer is "interposed between the substrate and the reflective metal layer" is a patentable distinction over van Baal because Applicants' layer order is different from van Baal's layer order, because Applicants' layer order substantially improves the heat resistance of the reflective articles compared to van Baal's layer order, and because the Examiner's proposed modification of van Baal to obtain Applicants' claim 1 layer order would defeat the express purpose of the plasma-polymerized silicone layer in van Baal and defeat van Baal's objective of providing molded articles for direct metalization. Third, van Baal also fails to teach the claim 15 haze-prevention layer thickness limitation.

1. Van Baal and the Present Invention Teach Different Solutions to Different Problems

Before directly addressing the Examiner's argument, it is useful to review the different problems addressed by van Baal and the present invention, and the different solutions that resulted. This is particularly important because both van Baal and the present invention use the term "haze," but attribute different meanings to that term. Note that two of the present inventors (Robert R. Gallucci and James R. Wilson) are also inventors on van Baal, and that Applicant's Agent contributed to the preparation and prosecution of the van Baal application.

Van Baal is generally directed to thermoplastic compositions for use in fabrication of reflective articles, such as automotive headlights. Van Baal, col. 1, lines 8-

16. Van Baal et al. were trying to provide thermoplastic compositions that would help "simplify production of these metalized plastic articles by [allowing] coating [of] metal directly onto the molded reflector." Van Baal, col. 1, lines 23-24. In order to provide the "high degree of reflectivity with low haze" required of the reflective article, the metal had to be coated on a very smooth surface. Van Baal, col. 1, lines 17-19. Note that in van Baal, "haze" refers to an objective optical property of a surface, specifically the ratio of light scattered to light reflected. Van Baal, col. 8, lines 1-5. If the metal was to be coated directly on a thermoplastic substrate, one of the requirements of the substrate was that it be molded so as to provide a very smooth surface for coating of reflective metal. Van Baal, col. 1, lines 31-34. Previous efforts to provide directly metalizable substrates had produced substrates with surface defects that became detectable only after metalization, "result[ing] in intolerable waste because of difficulty identifying defective molded articles before the metal coating has been applied." Van Baal, col. 1, lines 23-31. Van Baal et al. knew that dark, opaque thermoplastic resin compositions facilitated the detection of substrate surface defects. Van Baal, col. 2, lines 14-17. They also "found that known opacifying techniques, such as the addition of standard colorants, like titanium dioxide or carbon black, and the addition of non-miscible polymers . . . cause unacceptable losses of surface smoothness and gloss, and increased haze and diffuse reflectivity of the articles once metalized." Van Baal, col. 2, lines 26-32. One aspect of their invention was the discovery that particular colorants made the substrate composition dark and opaque without detracting from its surface smoothness. One way to achieve this was to use colorants that were soluble in the thermoplastic resin. Van Baal, col. 3, lines 6-7. Van Baal's working examples offer comparisons of substrate optical properties as a function of colorant type and amount. Van Baal, cols. 7-8, Tables 1 and 2. The results show that only inventive examples 1 and 2, utilizing particular colorants, provided the combined attributes of opacity, low lightness, and high gloss as molded, as well as excellent visual appearance, high reflectivity, low diffuse reflectivity, and low scattering [i.e., haze] after metalization. Van Baal, col. 9, lines 1-8. Thus, van Baal solved problems in the production of reflective article substrates by, inter alia, employing substrate colorants that did not increase the "haze" (i.e., light scattering) of a reflective article prepared by direct metalization of an as-molded substrate.

To the extent that van Baal mentions a layer prepared by plasma polymerization of a silicone precursor, it is in the context of a protective layer applied to a surface of the reflective metal layer opposite the thermoplastic substrate. Van Baal, col. 4, lines 52-56, and col. 7, lines 3-7. Applicants previously argued,

> Van Baal does not suggest interposing a silicone-derived clear coat between the thermoplastic substrate and the reflective metal layer. To the contrary, van Baal teaches away from such a modification by specifying that the silicone-derived clear coat is to be used as a clear protective layer on top of the reflective metal layer. *Id.* at col. 4, lines 52-56.

1/28/05 Amendment, p. 17, middle of page. To the extent that the Examiner may be relying on Applicants' previous statement that van Baal "teaches away" from the present invention, Applicants wish to reiterate that it is Applicants' position that van Baal does not teach or suggest interposing a silicone-derived clear coat between the thermoplastic substrate and the reflective metal layer. In other words, van Baal does not "teach away" in the sense of mentioning then denigrating the possibility of interposing a silicone-derived clear coat between the thermoplastic substrate and the reflective metal layer.

While also working in the area of reflective articles, the present inventors have tackled a different problem with a different solution. Whereas van Baal was concerned with producing thermoplastic substrates that were suitable for direct metalization -- that is, producing acceptable reflector substrates as molded – the present inventors were concerned with a particular degradation that occurred during use of reflective articles that were acceptable at the time they were produced. The present inventors observed that although reflective articles, in particular automotive headlights, exhibited high reflectivity and low light scattering when they were manufactured, these properties sometimes degraded over time. Visual inspection showed that areas of the previously bright reflective metal layers appeared "hazy." It was determined that the degradation in optical properties was related to localized elevated temperatures within the reflective article during use. In the laboratory environment, a change from a bright reflective surface to a hazy reflective surface could be induced by stepwise heating of a reflective article to increasing temperatures and determining the lowest temperature at which a change in the appearance of the reflective surface could be visually observed. This

temperature was termed the "haze onset temperature." Present application, page 24, Table 1, and page 26, Table 3. Thus, "haze" in the context of the present invention refers not to an objective measure of light scattering, as in van Baal, but to a subjective change in the appearance of the reflective surface at elevated temperature, as determined by visual inspection. See, for example, present application at paragraphs [0062] and [0066].

After extensive research to determine the nature of the problem and to explore possible solutions, it was discovered that the high-temperature-induced degradation of article reflectivity could be substantially reduced if the reflective articles included, between the thermoplastic substrate and the reflective metal layer, a haze prevention layer comprising certain materials. The suitable materials are united by the common properties of a volume resistivity of at least $1x10^{-4}$ ohm-centimeters measured according to ASTM D257 at 25°C and a tensile modulus of at least about $3x10^5$ pounds per square inch measured according to ASTM D638 at 25°C. Thus, the present inventors solved a problem related to the degradation of reflective articles <u>during use</u> by incorporating between the thermoplastic substrate and the reflective metal layer a haze prevention layer having particular properties. Contrast van Baal, which solved a problem in the <u>manufacturing</u> of reflective articles by, inter alia, employing particular substrate colorants that did not increase the light scattering of a reflective article prepared by direct metalization of an as-molded substrate.

The above discussion therefore makes clear that van Baal and the present invention, each considered as a whole, represent very different solutions to very different problems.

<u>2. Applicants' Layer Order Substantially Reduces Haze Formation at Elevated Temperature Compared to van Baal's Layer Order</u>

Applicants' claim 1 layer order is a patentable distinction versus van Baal because it substantially increases the "haze onset temperature" of the reflective article.

Applicants' rejected claims all include or further limit the claim 1 limitation that the haze-prevention layer is "interposed between the substrate and the reflective metal

layer." Van Baal does not teach or suggest this limitation. Because a prima facie case of obviousness requires that all limitations of the claim be taught or suggested by the prior art, *see, e.g.*, MPEP 2143.03, the Examiner has failed to establish a prima facie case of obviousness against Applicants' claim 1, and claim 1 is accordingly patentable over van Baal.

Noting that van Baal teaches the optional use of a silicone-derived clear coat deposited by plasma-based silicone polymerization on the face of the reflective metal layer opposite to thermoplastic substrate, and conceding that van Baal does not teach the use of a silicone-derived clear coat between the substrate and the reflective metal layer, the Examiner has nevertheless argued that the different layer orders in van Baal and the present invention do not constitute a patentable distinction. Specifically, the Examiner has repeatedly stated,

> Although Baal teaches the plasma-polymerized silicone clear coat to be on the outer surface of the metal layer, instead of between the substrate and the metal layer, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, that the order of the layers in an article would not have significant patentable weight. This is because whether the silicone-containing layer is between the substrate and the metal layer or outside the metal layer would not change the effects or properties of the article in term [sic] hazing prevention. And rearrangement of parts would not impart patentability to the article. See MPEP 2144.04VIC.

8/11/05 Office Action, page 3, third paragraph; 1/11/05 Office Action, page 6, first paragraph. Applicants respectfully disagree.

Applicants respectfully assert that the working examples in their specification clearly demonstrate that the location of their haze prevention layer is critical to achieving the desired effect of the invention. In particular, placement of a haze-prevention layer between the substrate and the reflective metal layer significantly improves the heat resistance of the reflective article compared to a corresponding reflective article lacking the haze-prevention layer but having a layer of similar composition on the surface of the reflective metal layer opposite to the substrate. Simply put, reflective articles having the

layer structure of the present invention are substantially more heat-resistant than articles having the layer structure of van Baal.

In support of this argument, Applicants call the Examiner's attention to Table 1 on page 24 of the present application, as well as the accompanying text. Example A, a comparison, consisted of a thermoplastic substrate, a reflective metal layer coated directly on the thermoplastic substrate, and a protective top coat layer coated on the surface of the reflective metal layer opposite the thermoplastic substrate. Examples 1-3, representative of the invention, included the same layers and in addition included a haze-prevention layer of varying thickness between the thermoplastic substrate and the reflective metal layer. Samples were heated from 198°C to 210°C in 2°C increments and visually inspected for haze. The lowest temperature at which haze was observed was reported as the haze onset temperature ("Haze Onset °C" in Table 1). The results in Table 1, reproduced below, demonstrate that inventive Examples 1-3 exhibited significantly higher haze onset temperatures (208°C, 210°C, and 210°C) than comparative Example A (204°C).

Table 1

	Haze Onset °C	Plasma-Polymerized Organosilicone Coating Thickness
Example A PEI – No plasma-polymerized organosilicone under-coat	204	None
Example 1 PEI - 2 minute plasma-polymerized organosilicone under-coat	208	41 nm
Example 2 PEI - 4 minute plasma-polymerized organosilicone under-coat	210	64 nm
Example 3 PEI - 8 minute plasma-polymerized organosilicone under-coat	210	145 nm

Applicants also call the Examiner's attention to Table 3 on page 26, and the accompanying description. Comparative Examples B-I each consisted of a thermoplastic substrate, a reflective metal layer coated directly on the thermoplastic substrate, and a protective top coat layer coated on the surface of the reflective metal layer opposite the thermoplastic substrate. Examples 4-11, representative of the invention, included the same layers and in addition included a haze-prevention layer, formed by plasma polymerization of hexamethyldisiloxane, between the thermoplastic substrate and the

reflective metal layer. Each sample was heated in 2°C increments, starting at a temperature 20°C below the glass transition temperature of the substrate thermoplastic. The lowest temperature at which haze was observed was reported as the haze onset temperature. The results in Table 3, reproduced below, show that for each thermoplastic tested, the inclusion of the haze-prevention layer in the inventive samples significantly increased the haze onset temperature.

Table 3

Thermoplastic Resin	Control Example	Only reflective layer	Invention Example	Reflective layer with plasma-polymerized organosilicone underlayer
		Onset Haze (°C)		Onset Haze (°C)
Polyethersulfone	B	206	4	216
Bisphenol A Polysulfone	C	178	5	182
Bisphenol A Polycarbonate	D	139	6	143
Isophorone bisphenol based polycarbonate, APEC 9359	E	173	7	178
Isophorone bisphenol based polycarbonate, APEC 9379	F	184	8	194
75:25 blend of Polyetherimide and Polyester carbonate	G	196	9	198
Polyetherimide with mold release	H	204	10	210
Polyetherimide Sulfone	I	221	11	225

The results above collectively show that use of a haze-prevention layer interposed between the thermoplastic substrate and the reflective metal layer substantially improves the heat resistance of reflective articles. Note that each of comparative Examples A-I consisted of a thermoplastic substrate, a reflective metal layer coated directly on the substrate, and a protective layer coated on the surface of the reflective metal layer opposite to the substrate. These comparative examples are thus comparable to van Baal's teaching to directly coat the metal layer on the substrate and coat a protective layer on top of the reflective layer. These results clearly rebut the Examiner's statement that "whether the silicone-containing layer is between the substrate and the metal layer or outside the metal layer would not change the effects or properties of the article in term [sic] hazing prevention." Applicants' claim 1 limitation of "a haze-prevention layer <u>interposed between the substrate and the reflective metal layer</u>" is therefore a patentable distinction over van Baal.

Furthermore, the sections of the MPEP cited by the Examiner, MPEP 2144.04 VI. C., and the cases cited therein actually support the patentability of the rejected claims over van Baal. MPEP 2144.04 VI. C. is reproduced in its entirety below.

> C. Rearrangement of Parts
> *In re Japikse*, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950) (Claims to a hydraulic power press which read on the prior art except with regard to the position of the starting switch were held unpatentable because shifting the position of the starting switch would not have modified the operation of the device.); *In re Kuhle*, 526 F.2d 553, 188 USPQ 7 (CCPA 1975) (the particular placement of a contact in a conductivity measuring device was held to be an obvious matter of design choice). However, "The mere fact that a worker in the art could rearrange the parts of the reference device to meet the terms of the claims on appeal is not by itself sufficient to support a finding of obviousness. The prior art must provide a motivation or reason for the worker in the art, without the benefit of appellant's specification, to make the necessary changes in the reference device." *Ex parte Chicago Rawhide Mfg. Co.*, 223 USPQ 351, 353 (Bd. Pat. App. & Inter. 1984).

MPEP 2144.04 VI. C. Both *In re Japikse*, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950) and *In re Kuhle*, 526 F.2d 553, 188 USPQ 7 (CCPA 1975) are distinguishable as relating to the placement of a particular component in an apparatus, whereas the present issue relates to the layer order in a layered article. The effect of rearrangement of parts on an apparatus is much more predictable than the effect of layer order changes in the layered articles at issue here. In particular, note that layer thicknesses, the changes in each layer's behavior with temperature change, and the chemical interactions between layers make the effect of layer order changes unpredictable. Furthermore, the "rearrangement of parts" in *Japikse* "would not have modified the operation of the device," whereas Applicants have demonstrate via their original working examples that the use of a plasma-polymerized organosilicone layer between the substrate and the reflective metal layer significantly improves the heat resistance of the reflective article.

The only remaining portion of MPEP 2144.04 VI. C. is a quote from *Ex parte Chicago Rawhide Mfg. Co.*, 223 USPQ 351, 353 (Bd. Pat. App. & Inter. 1984). That case, like *Japikse* and *Kuhle*, is distinguishable as relating to the issue of placement of components in an apparatus. And, even to the extent that *Chicago Rawhide* could be

applied by analogy to a layered article, its statement that "[t]he prior art must provide a motivation or reason for the worker in the art, without the benefit of appellant's specification, to make the necessary changes in the reference device" supports the patentability of Applicants' claim 1 invention. In general, there is no motivation for one of ordinary skill in the art to modify a reference if the proposed modification destroys the intended function of the reference. *See In re Fritch*, 23 USPQ2d 1780, 1783 (Fed. Cir. 1992). Here, there is no motivation to move van Baal's plasma-polymerized hexamethyldisilazane layer from the exposed surface of the reflective metal layer to a position interposed between the substrate and the reflective metal layer. To do so would defeat the layer's express purpose of "protect[ing] the metal surface from scratching, oxidation, or related problems." Van Baal, col. 4, lines 52-56. It would also defeat a primary purpose of van Baal, which, according to the very first phrase in the "Detailed Description" section, is to provide "Molded articles suitable for direct metalization." Van Baal, col. 1, line 56. If a layer is interposed between the substrate and the reflective metal layer, then the substrate is not used for "direct metalization."

Thus, the Examiner's argument that it is obvious to modify van Baal ignores that the proposed modification would defeat the express purpose of van Baal's plasma-polymerized layer prevent and conflict with van Baal's primary objective of providing substrates suitable for direct metalization. There is therefore no motivation for one of ordinary skill in the art to modify van Baal to obtain a species embraced by the rejected claims.

To summarize, Applicants' claim 1 limitation that the haze-prevention layer is "interposed between the substrate and the reflective metal layer" constitutes a patentable distinction versus van Baal, and there is also no motivation for one of ordinary skill in the art to make the Examiner's proposed modification of van Baal. Applicants have therefore "clearly point[ed] out the patentable novelty which [they] think[] the claims present in view of the state of the art disclosed by the references cited or the objections made." 8/11/05 Office Action, page 5, paragraph no. 11.

Accordingly, claim 1 is patentable over van Baal. Given that claims 2, 4-11, 15-19, 21, and 22 each include or further limit the limitations of claim 1, they, too, are patentable over van Baal.

3. Applicants' Claim 15 is Further Patentable Over van Baal

Applicants' claim 15 is further patentable over van Baal because its haze-prevention layer thickness is not taught by van Baal. Establishing a prima facie case of obviousness requires that all limitations of the claim be taught or suggested by the prior art. *See, e.g.*, MPEP 2143.03; *CFMT, Inc. v. Yieldup Intern. Corp.*, 349 F.3d 1333, 1342 (Fed. Cir. 2003); *In re Royka*, 490 F.2d 981, 985 (C.C.P.A. 1974). Claim 15 includes the limitation that "the haze-prevention layer has a thickness of about 100 nanometers to about 100 micrometers." Van Baal does not teach this limitation for at least two reasons. First, as explained above, van Baal does not teach or suggest a haze-prevention layer of any composition or thickness. Second, to the extent that the Examiner is relying on improper analogies between van Baal's protective "silicone-derived clear coat" and Applicants' haze-prevention layer, van Baal does not teach a silicone-derived clear coat in the claim 15 thickness range of "about 100 nanometers to about 100 micrometers." In fact, van Baal's only teaching about the thickness of a "silicone-derived clear coat" is in the working examples, where a "50-100 Angstrom" (5-10 nanometer) clear coat is used. Van Baal thus fails to teach the claim 15 thickness limitation, and claim 15 is accordingly further patentable over van Baal.

4. Summary

For all of the above reasons, Applicants respectfully request the reconsideration and withdrawal of the rejection of claims 1, 2, 4-11, 15-19, 21, and 22 under 35 U.S.C. § 103(a) over van Baal.

It is believed that the foregoing remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance is requested.

Applicants respectfully request the courtesy of a telephonic interview with the Examiner and the Examiner's supervisor as soon as possible after the Examiner has initially considered this Response. The Examiner is respectfully requested to call Applicants' Agent at the number below so that a proposed interview time can be selected and an "Applicant Initiated Interview Request Form" (PTOL-413A) can be submitted.

If there are any additional charges with respect to this Response or otherwise, please charge them to Deposit Account No. 50-3619 maintained by Assignee.

Respectfully submitted,

CANTOR COLBURN LLP
Applicants' Attorneys

By: J Michael Buchanan
J. Michael Buchanan
Registration No. 44,571

Date:	September 26, 2005
Customer No.:	23413
Telephone:	(860) 286-2929